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Version: 1

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## AU OPTRONICS CORPORATION

### Product Specifications

### 17.0" WXGA Color TFT-LCD Module

**Model Name: M170XW01 V.1**

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Customer	Checked & Approved by



## Product Specifications

### 17.0" WXGA Color TFT-LCD Module Model Name: M170XW01 V.1

(◆) Preliminary Specifications  
( ) Final Specifications

Note: This Specification is subject to change without notice.



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## ii Record of Revision

Version and Date	Page	Old description	New Description	Remark
0.1 2003/12/15	All	First Edition for Customer	All	
0.2 2004/02/05	07	Electrical Interface = R/G/B data, clock	Electrical Interface = LVDS (1 ch)	Update
	16	Max. frame rate =70Hz	Max. frame rate = 80Hz	Update
0.3 2004/03/01	25	The thickness= 17.2±0.5	The thickness= 17.3±0.5	Update
0.4 2004/05/24	07	Contrast Ratio= 600:1(Typ)	Contrast Ratio= 800:1(Typ)	Update
	09	Flicker= NA	Flicker (Max= -20dB)	Update
	15, 16	Signal Description	Add Note 1, 2, 3	Update
	18	Data CLK(Min=35, Max=83MHz) H-Period (Min=1320 Tclk) V-Period (Max=823 Th) Frame Rate (Max=80Hz)	Data CLK(Min=45, Max=81MHz) H-Period (Min=1330 Tclk) V-Period (Max=860 Th) Frame Rate (Max=75Hz)	Update
	20	Irush= (Max= TBD)	Irush= (Max= 3.0A)	Update
	21	Power ON/OFF Sequence T1 (Min= NA) T6 (Min= NA)	Power ON/OFF Sequence T1 (Min= 0.5 ms) T6 (Min= 0.5 ms)	Update
0.5 2004/05/27	22	LTCFL (Min= 30,000 Hours) (Typ= NA)	LTCFL (Min= 25,000 Hours) (Typ= 35,000 Hours)	Update



## 1.0 Handling Precautions

1. Since front polarizer is easily damaged, pay attention not to scratch it.
2. Be sure to turn off power supply when inserting or disconnecting from input connector.
3. Wipe off water drop immediately. Long contact with water may cause discoloration or spots.
4. When the panel surface is soiled, wipe it with absorbent cotton or other soft cloth.
5. Since the panel is made of glass, it may break or crack if dropped or bumped on hard surface.
6. Since CMOS LSI is used in this module, take care of static electricity and insure human earth when handling.
7. Do not open nor modify the Module Assembly.
8. Do not press the reflector sheet at the back of the module to any directions.
9. At the insertion or removal of the Signal Interface Connector, be sure not to rotate nor tilt the Interface Connector of the TFT-LCD module.
10. After installation of the TFT-LCD module into an enclosure (LCD monitor housing, for example), do not twist nor bend the TFT -LCD module even momentarily. At designing the enclosure, it should be taken into consideration that no bending/twisting forces are applied to the TFT -LCD module from outside. Otherwise the TFT -LCD module may be damaged.



## 2.0 General Description

This specification applies to the 17.0 inch wide Color TFT-LCD Module M170XW01. The display supports the WXGA (1280 x 768) screen format and 16.2M colors (RGB 6-bits + FRC data). All input signals are 1 Channel LVDS interface compatible. This module does not contain an inverter card for backlight.

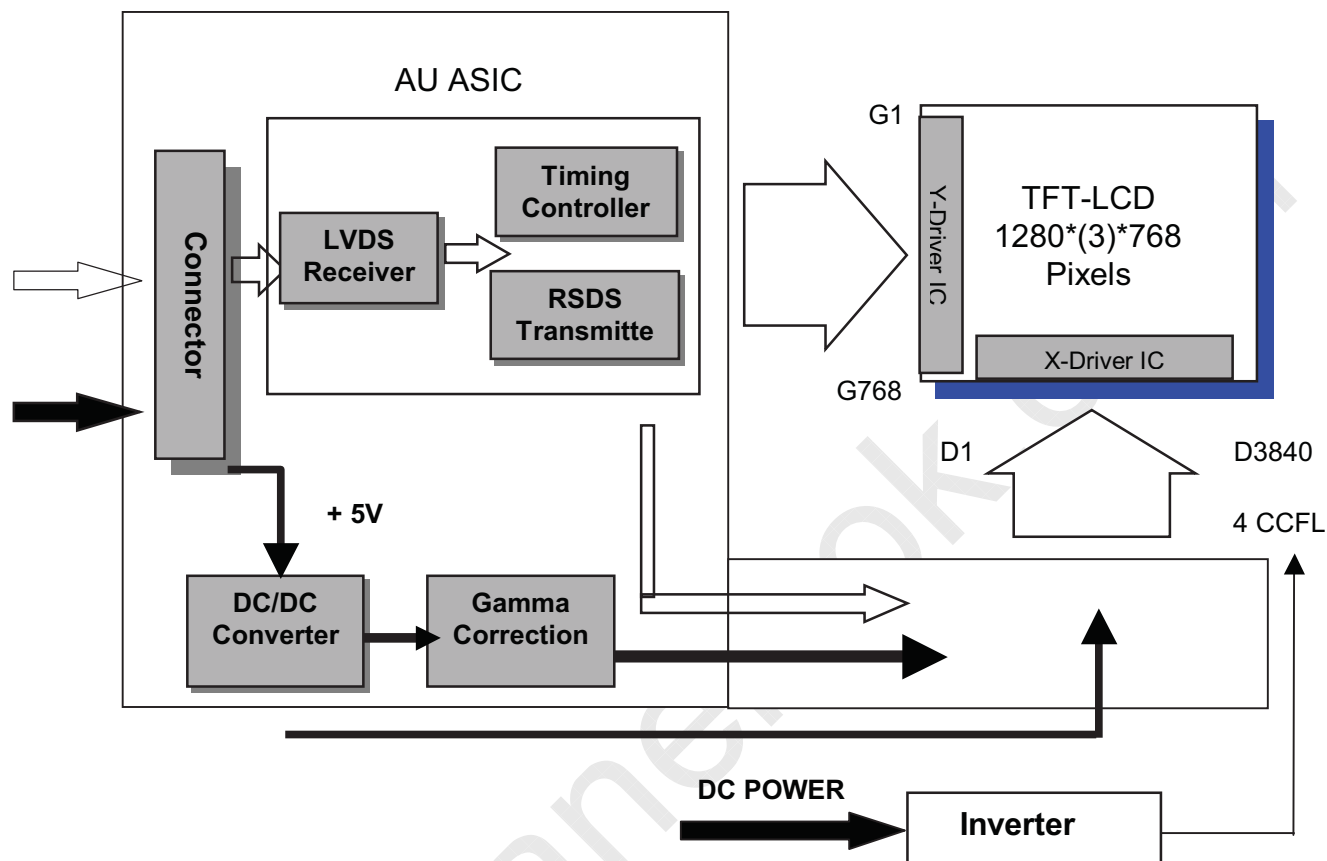
### 2.1 Display Characteristics (under 25 °C condition)

ITEMS	Unit	SPECIFICATIONS
Screen Diagonal	[mm]	432(17.0" Wide)
Active Area	[mm]	370.56 (H) x 222.34 (V)
Pixels H x V		1280(x3) x 768
Pixel Pitch	[mm]	0.2895 (per one triad) x 0.2895
Pixel Arrangement		R.G.B. Vertical Stripe
Display Mode		Normally Black
White Luminance	[cd/m <sup>2</sup> ]	450 (center, Typ) @11mA
Contrast Ratio		800 : 1 (Typ)
Optical Response Time	[msec]	25 (Typ)
Color Saturation		72% NTSC
Nominal Input Voltage VDD	[Volt]	+5.0 V
Power Consumption (VDD line + CCFL line)	[Watt]	30W (Typ) (w/o Inverter, All white pattern)
Weight	[Grams]	2000 (Typ)
Physical Size	[mm]	404 (H) x 248.5 (V) x 17.2 (D) (Typ)
Electrical Interface		LVDS (1 ch)
Support Color		16.2M colors (RGB 6-bit + FRC data)
Temperature Range		
Operating	[°C]	0 to +50
Storage (Shipping)	[°C]	-20 to +60



## 2.2 Functional Block Diagram

The following diagram shows the functional block of the 17.0 inches Wide Color TFT-LCD Module:



HIROSE DF14H-20P-1.25H

Mating Type: HIROSE DF14-20S-1.25C





### 2.3 Optical Characteristics (under 25 °C condition)

Item	Unit	Conditions	Min.	Typ.	Max.	Note
Viewing Angle	[degree]	Horizontal (Right)	75	85	-	
		CR = 10 (Left)	75	85	-	
		Vertical (Up)	75	85	-	
		CR = 10 (Down)	75	85	-	
Contrast ratio		Normal Direction	600	800	-	
Response Time	[msec]	Rasing Time	-	15	25	<b>Note 1</b>
		Falling Time	-	10	15	
		Raising + Falling	-	25	40	
Color / Chromaticity Coordinates (CIE)		Red x	0.61	0.64	0.67	
		Red y	0.31	0.34	0.37	
		Green x	0.26	0.29	0.32	
		Green y	0.58	0.61	0.64	
		Blue x	0.11	0.14	0.17	
		Blue y	0.04	0.07	0.10	
Color Coordinates (CIE) White		White x	0.28	0.31	0.34	
		White y	0.30	0.33	0.36	
White Luminance @ CCFL 11.0mA (Center)	[cd/m <sup>2</sup> ]		400	450	-	
Luminance Uniformity	[%]		75	80		<b>Note 2</b>
Crosstalk (in 75Hz)	[%]		-	-	1.5	<b>Note 3</b>
Flicker	dB		-	-	-20	<b>Note 4</b>

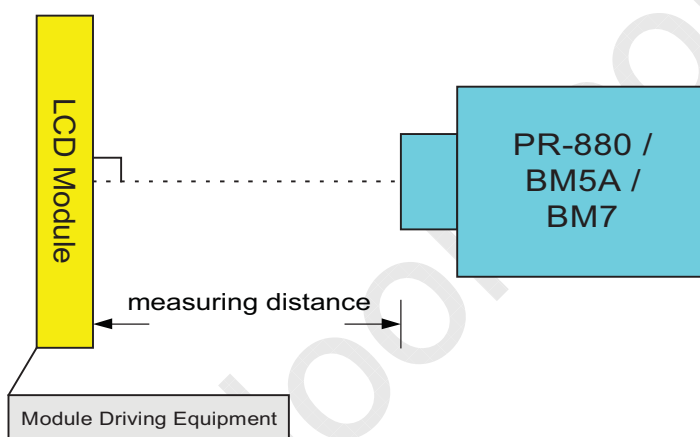


**Equipment:** Pattern Generator, Power Supply, Digital Voltmeter, Luminance meter  
(PR 880, BM-5A / BM7)

Aperture 1° with 100cm VD or 2° with 50cm viewing distance

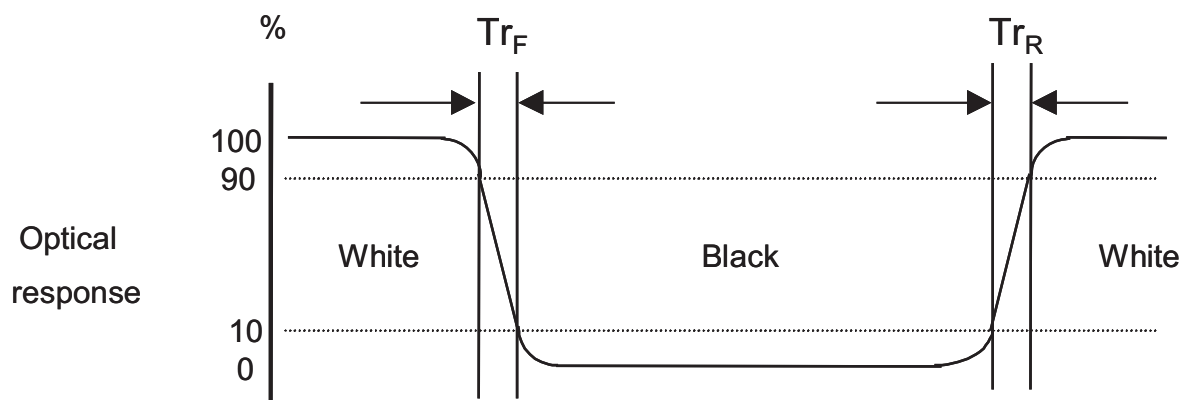
Test Point Center (VESA point 9)

Environment < 1 lux



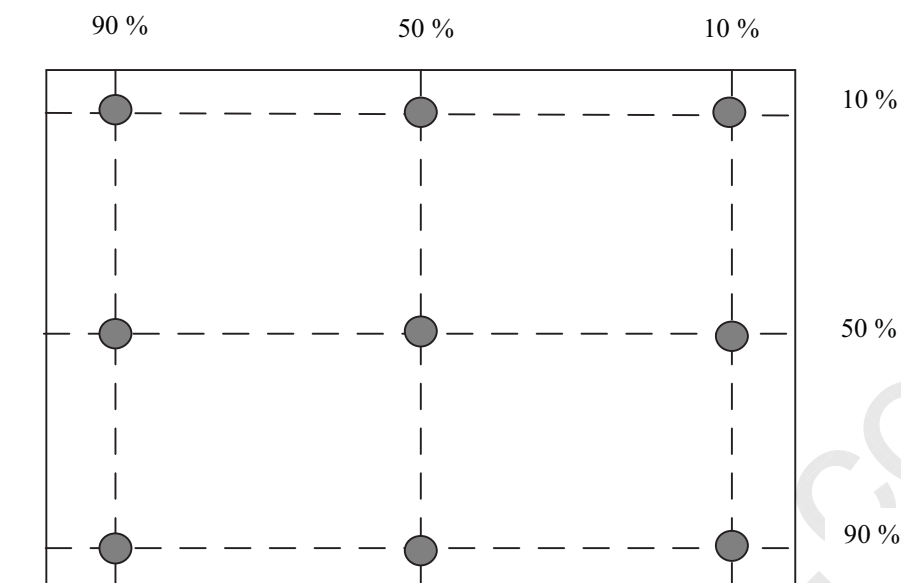
### Note 1: The Definition of Response time

The output signals of photodetector are measured when the input signals are changed from “Black” to “White” (rising time), and from “White” to “Black” (falling time), respectively. The response time is interval between the 10% and 90% of amplitudes.



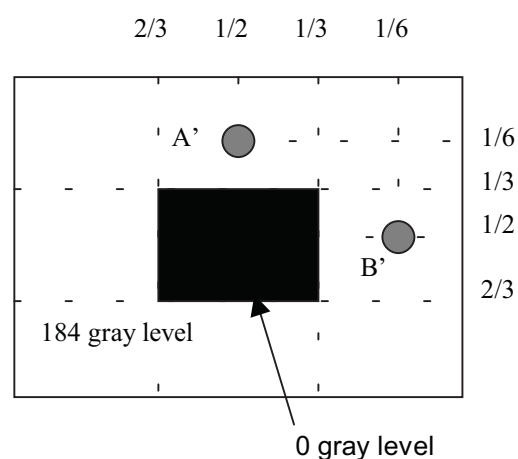
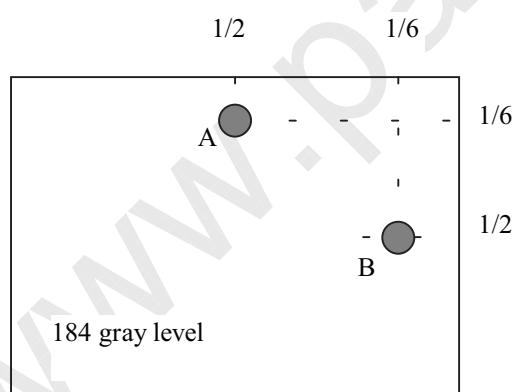


**Note 2: Brightness uniformity of these 9 points is defined as below**



$$\text{Uniformity} = \frac{\text{Minimum Luminance in 9 Points (1-9)}}{\text{Maximum Luminance in 9 Points (1-9)}}$$

**Note 3: The Definition of Crosstalk**



Unit: percentage of dimension of display area

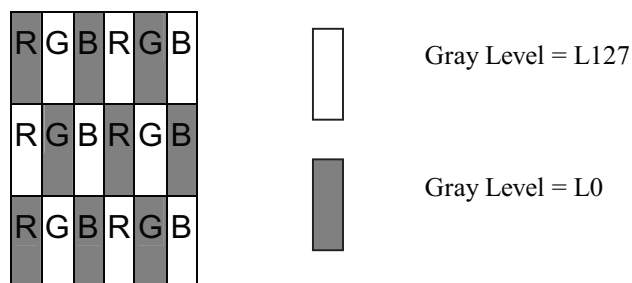
$|L_A - L_{A'}| / L_A \times 100\% = 1.5\% \text{ max.}$ ,  $L_A$  and  $L_B$  are brightness at location A and B

$|L_B - L_{B'}| / L_B \times 100\% = 1.5\% \text{ max.}$ ,  $L_{A'}$  and  $L_{B'}$  are brightness at location A' and B'

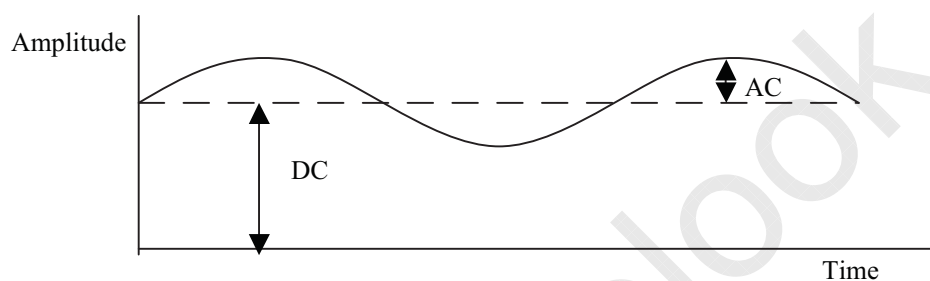


#### Note 4: The Definition of Flicker

### Test Pattern: Subchecker Pattern



Method: Record dBV & DC value with (WESTAR)TRD-100



$$\text{Flicker (dB)} = 20 \log \frac{\text{AC Level(at 30 Hz)}}{\text{DC Level}}$$

## 2.4: Pixel format image

Following figure shows the relationship of the input signals and LCD pixel format.

	1			2			1279						1280					
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### 3.0 Electrical characteristics

#### 3.1 Absolute Maximum Ratings

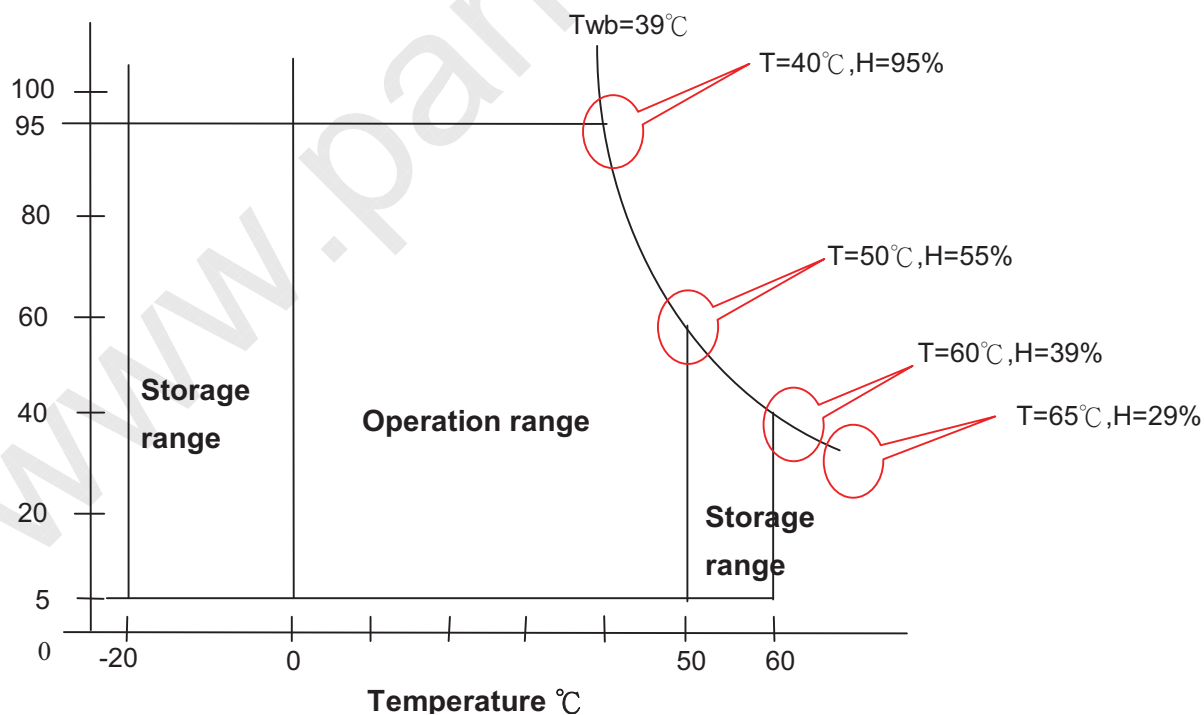
Absolute maximum ratings of the module is as following:

Item	Symbol	Min	Max	Unit	Conditions
Logic/LCD Drive Voltage	VIN	+4.5	+5.5	[Volt]	
CCFL Inrush current	ICFLL	-	20	[mA]	<b>Note 1</b>
CCFL Current	ICFL	-	12.0	[mA] rms	
Operating Temperature	TOP	0	+50	[°C]	<b>Note 2</b>
Operating Humidity	HOP	8	95	[%RH]	<b>Note 2</b>
Storage Temperature	TST	-20	+60	[°C]	<b>Note 2</b>
Storage Humidity	HST	8	95	[%RH]	<b>Note 2</b>

**Note 1: Duration=50 ms, Inverter: ACHME/AMN0732040 Rev. B**

**Note 2: Maximum Wet-Bulb should be 39 °C and No condensation**

Relative Humidity %





### 3.2 Connectors

Physical interface is described as for the connector on module. These connectors are capable of accommodating the following signals and will be following components.

Connector Name / Designation	Interface Connector / Interface card
Manufacturer	HIROSE or compatible
Type Part Number	DF14H-20P-1.25H
Mating Housing Part Number	DF14-20S-1.25C
Connector Name / Designation	Lamp Connector / Backlight lamp
Manufacturer	JST
Type Part Number	BHSR-02VS-1
Mating Type Part Number	SM02B-BHSS-1-TB

### 3.3 Signal Pin

Pin#	Signal Name	Pin#	Signal Name
1	POWER, +5.0V	2	POWER, +5.0V
3	GND	4	GND
5	RxIN0-	6	RxIN0+
7	GND	8	RxIN1-
9	RxIN1+	10	GND
11	RxIN2-	12	RxIN2+
13	GND	14	RxCLKIN-
15	RxCLKIN+	16	GND
17	RxIN3-	18	RxIN3+
19	GND	20	NC (FOR AUO TEST)



### 3.4 Signal Description

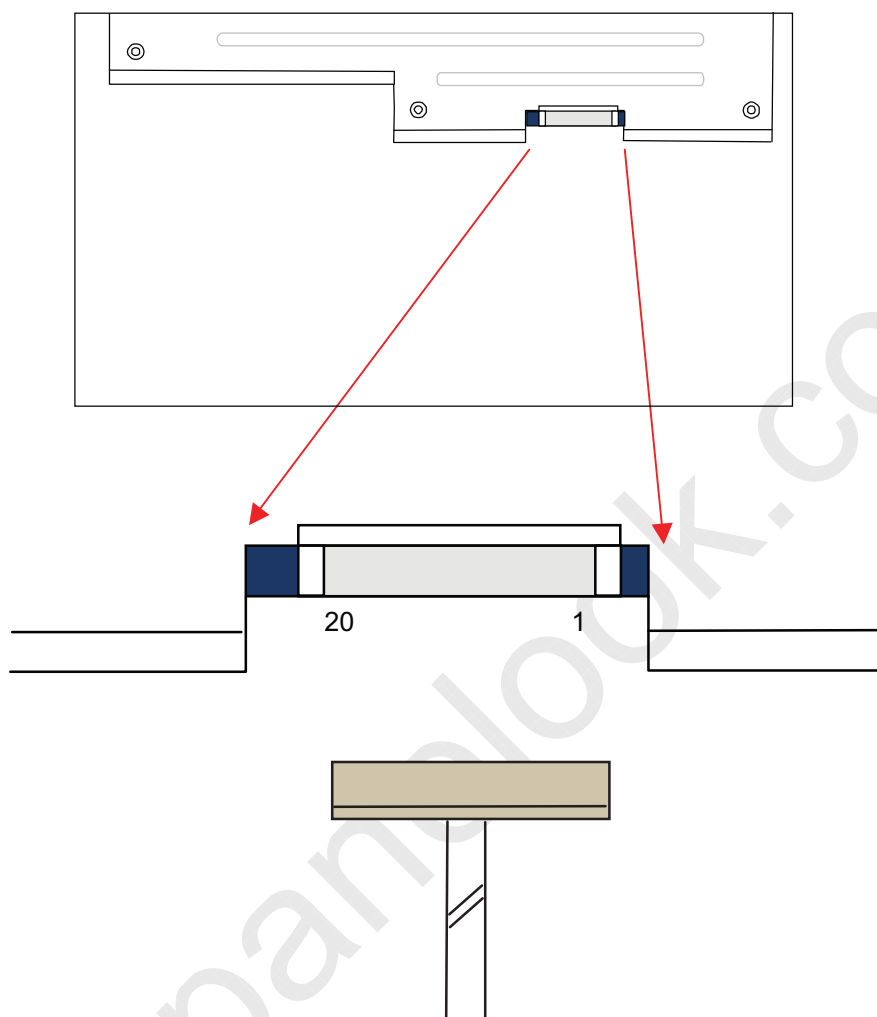
PIN #	SIGNAL NAME	DESCRIPTION
1	POWER	+5.0V Power supply
2	POWER	+5.0V Power supply
3	GND	Power Ground
4	GND	Power Ground
5	RxIN0-	Negative LVDS differential data input
6	RxIN0+	Positive LVDS differential data input
7	GND	Power Ground
8	RxIN1-	Negative LVDS differential data input
9	RxIN1+	Positive LVDS differential data input
10	GND	Power Ground
11	RxIN2-	Negative LVDS differential data input
12	RxIN2+	Positive LVDS differential data input
13	GND	Power Ground
14	RxCLKIN-	Negative LVDS differential clock input
15	RxCLKIN+	Positive LVDS differential clock input
16	GND	Power Ground
17	RxIN3-	Negative LVDS differential data input
18	RxIN3+	Positive LVDS differential data input
19	GND	Power Ground
20	NC	For AUO Test

**Note 1:** All GND (ground) pins should be connected together and to VSS which should also be connected to the LCD's metal frame.

**Note 2:** All VCC (power input) pins should be connected together.



**Note 3:** The drawing of connector.

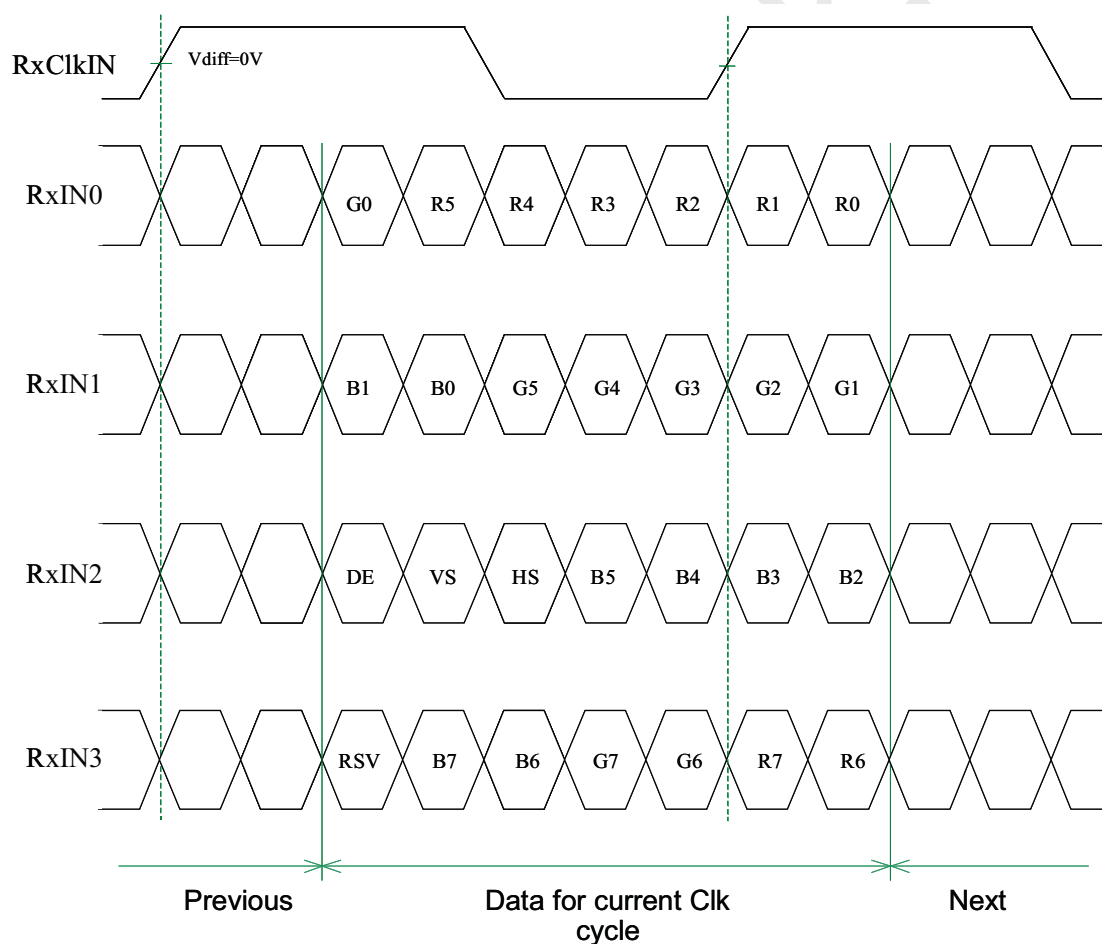






LVDS DATA Name	Description
DSP	Display Timing: (DE mode) When the signal is high, the pixel data shall be valid to be displayed
V-S	Vertical Sync: Both Positive and Negative polarity are acceptable
H-S	Horizontal Sync: Both Positive and Negative polarity are acceptable

### 8-bits input data format:



**Note: R/G/B data 7:MSB, R/G/B data 0:LSB**



### 3.5 Interface Timings

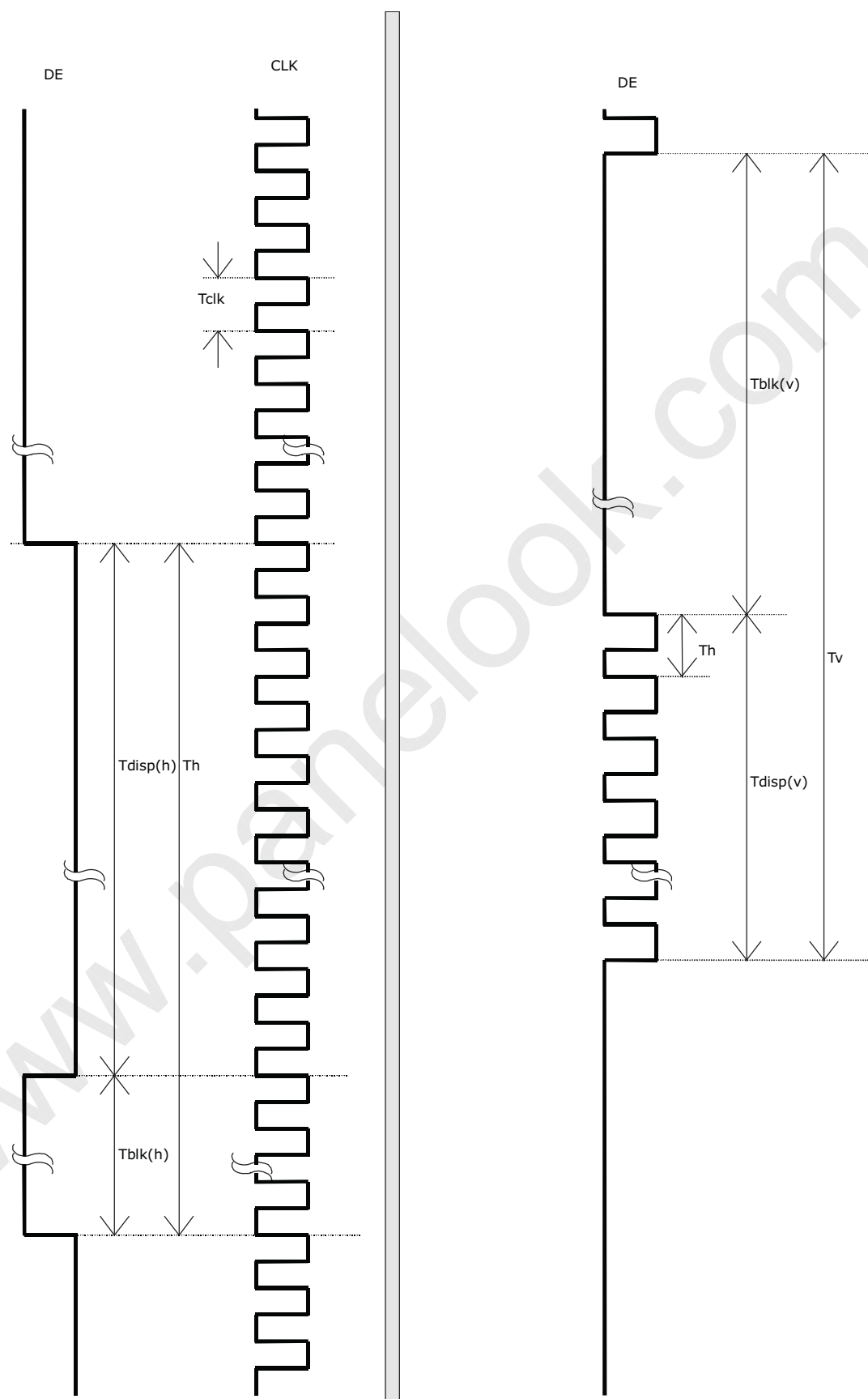
#### 3.5.1 Timing Characteristics

Item		Symbol	Min	Typ	Max	Unit
Data CLK		Tclk	45	64	81	MHz
H-section	Period	Th	1330	1350	1440	Tclk
	Display Area	Tdisp(h)	1280	1280	1280	Tclk
V-section	Period	Tv	777	790	860	Th
	Display Area	Tdisp(v)	768	768	768	Th
Frame Rate		F	47	60	75	Hz

**Note:** DE mode only.



### 3.5.2 Timing Definition

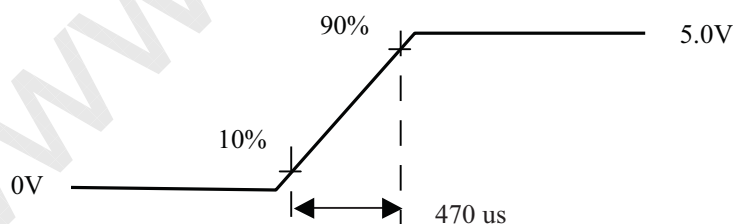
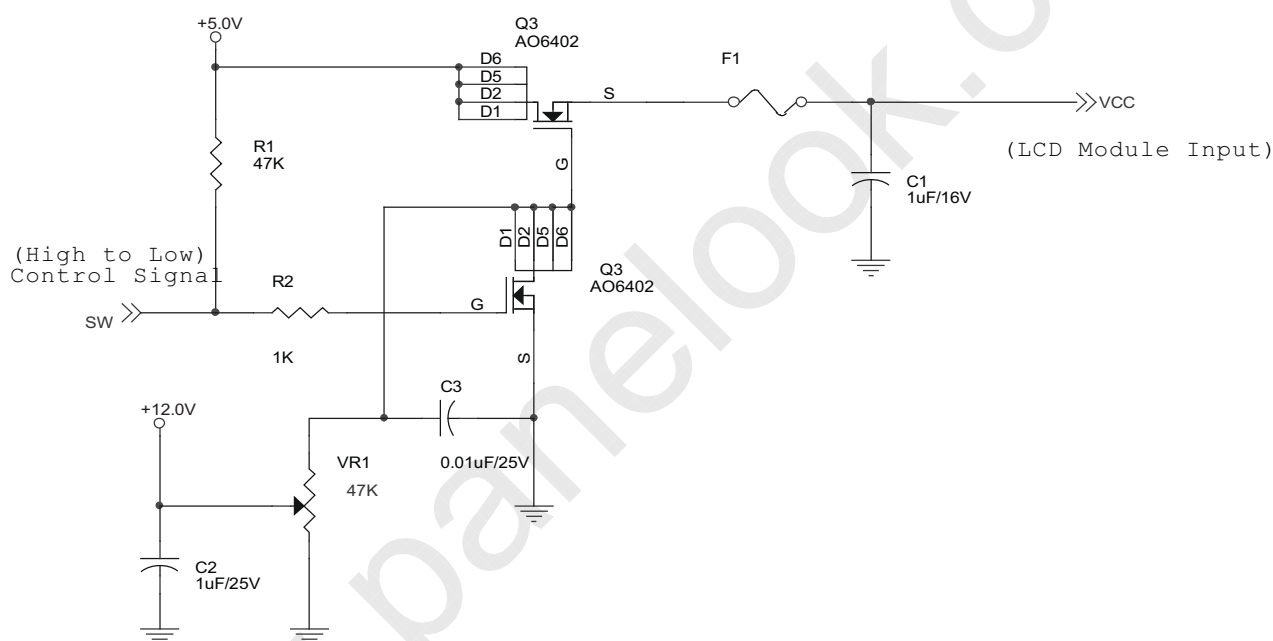




### 3.6 Power Consumption

Symbol	Parameter	Min	Typ	Max	Unit	Condition
VDD	Logic/LCD Drive Voltage	4.5	5	5.5	[Volt]	
IDD	VDD current	-	950	1200	[mA]	Vin=5V, All White Pattern
Irush	LCD Inrush Current	-	-	3.0	[A]	<b>Note</b>
PDD	VDD Power	-	4.75	6.6	[Watt]	Vin=5V, All White Pattern
VDDrp	Allowable Logic/LCD Drive Ripple Voltage	-	-	100	[mV] p-p	

**Note:** Measurement conditions:

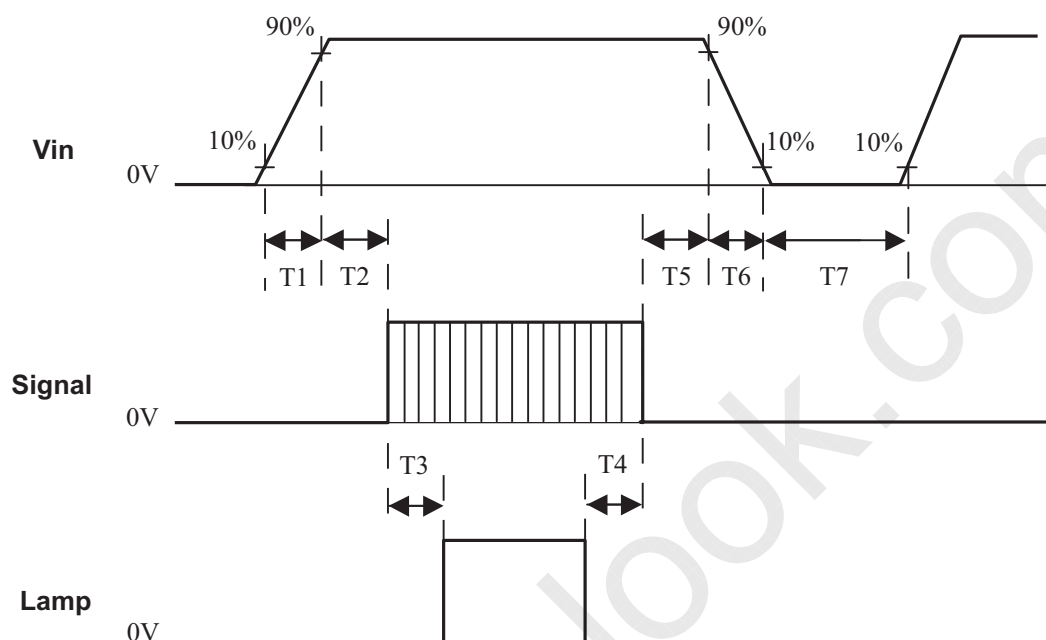


**Vin rising time**



### 3.7 Power ON/OFF Sequence

Vin and lamp power on/off sequence are as follows. The timing parameters of interface signal are shown in the table below.



Symbol	Values			Unit
	Min	Typ	Max	
T1	0.5	-	10	[ms]
T2	0.5	25	50	[ms]
T3	200	-	-	[ms]
T4	200	-	-	[ms]
T5	0.5	16	50	[ms]
T6	0.5	-	10	[ms]
T7	1000	-	-	[ms]



## 4.0 Backlight Characteristics

### 4.1 Signal for Lamp connector

Pin #	Signal Name
1	Lamp High Voltage
2	Lamp Low Voltage

### 4.2 Parameter guideline for CCFL Inverter

Symbol	Parameter	Min	Typ	Max	Unit	Condition
ISCFL	CCFL standard current	10.5	11.0	11.5	[mA] rms	(Ta=25°C)
IRCFL	CCFL operation range	5.5	11.0	12.0	[mA] rms	(Ta=25°C)
ICFL	CCFL Inrush current	-	-	20	[mA]	<b>Note 1</b>
FCFL	CCFL Frequency	40	50	60	[KHz]	(Ta=25°C) <b>Note 2</b>
ViCFL (0°C)	CCFL Ignition Voltage	1650	-	-	[Volt] rms	(Ta=0°C) <b>Note 3</b>
ViCF (25°C)	CCFL Ignition Voltage	1250	-	-	[Volt] rms	(Ta=25°C) <b>Note 3</b>
TCFL	CCFL Dark start time	-	-	0.5	sec	(Ta=25°C)
VCFL	CCFL Discharge Voltage	-	560 (@11mA)	680 (@5.5mA)	[Volt] rms	(Ta=25°C) <b>Note 4</b>
PCFL	CCFL Power consumption	-	24.6	28	[Watt]	(Ta=25°C) <b>Note 5</b>
LTCFL	CCFL life Time	25,000	35,000	-	[Hour]	<b>Note 6</b>

**Note 1:** Duration=50 ms, Inverter: ACHME/AMN0732040 Rev. B

**Note 2:** CCFL Frequency should be carefully determined to avoid interference between inverter and TFT LCD

**Note 3:** CCFL inverter should be able to give out a power that has a generating capacity of over 1650 voltage. Lamp units need 1650 voltage minimum for ignition

**Note 4:** The variance of CCFL discharge voltage is  $\pm 10\%$ .

**Note 5:** CCFL power consumption shown above excluding loss of inverter. CCFL current is the typical value for reference.

**Note 6:** CCFL life time is determined as the time at which brightness of lamp is 50% compared to that of initial value at the typical lamp current on condition of continuous operating at  $25 \pm 2^\circ\text{C}$ .



## 5.0 Vibrations, Shock, and Drop

### 5.1 Vibration & Shock

Frequency: 10 - 200Hz  
Sweep: 30 Minutes each Axis (X, Y, Z)  
Acceleration: 1.5G (10~200Hz P- P)  
Test method:

Acceleration (G)	1.5
Frequency (Hz)	10~200~10
Active time (min)	30

### 5.2 Shock Test Spec:

Acceleration (G)	50
Active time	20
Wave form	half-sin
Times	1

Direction:  $\pm X$ ,  $\pm Y$ ,  $\pm Z$

### 5.3 Drop test

Package test: The drop height is 60 cm.



## 6.0 Environment

The display module will meet the provision of this specification during operating condition or after storage or shipment condition specified below. Operation at 10% beyond the specified range will not cause physical damage to the unit.

### 6.1 Temperature and Humidity

#### 6.1.1 Operating Conditions

The display module operates error free, when operated under the following conditions;

Temperature	0 °C to 50 °C
Relative Humidity	8% to 95%
Wet Bulb Temperature	39.0 °C

#### 6.1.2 Shipping Conditions

The display module operates error free, after the following conditions;

Temperature	-20 °C to 60 °C
Relative Humidity	8% to 95%
Wet Bulb Temperature	39.0 °C

### 6.2 Atmospheric Pressure

The display assembly is capable of being operated without affecting its operations over the pressure range as following specified;

	Pressure	Note
Maximum Pressure	1040hPa	0m = sea level
Minimum Pressure	674hPa	3048m = 10.000 feet

**Note:** Non-operation attitude limit of this display module = 30,000 feet. = 9145 m.





### 6.3 Thermal Shock

The display module will not sustain damage after being subjected to 100 cycles of rapid temperature change. A cycle of rapid temperature change consists of varying the temperature from -20<sup>0</sup>C to 60<sup>0</sup>C, and back again.

Thermal shock cycle                -20 <sup>0</sup>C for 30min  
   60 <sup>0</sup>C for 30min

Power is not applied during the test. After temperature cycling, the unit is placed in normal room ambient for at least 4 hours before powering on.

## 7.0 Reliability

This display module and the packaging of that will comply following standards.

### 7.1 Failure Criteria

The display assembly will be considered as failing unit when it no longer meets any of the requirements stated in this specification. Only as for maximum white luminance, following criteria is applicable.

**Note:** Maximum white Luminance shall be 225 cd/m<sup>2</sup> or more.

### 7.2 Failure Rate

The average failure rate of the display module (from first power-on cycle till 1,000 hours later) will not exceed 1.0%. The average failure rate of the display module from 1,000 hours until 16,000 hours will not exceed 0.7% per 1000 hours.

#### 7.2.1 Usage

The assumed usage for the above criteria is:

220 power-on hours per month

500 power on/off cycles per month

Maximum brightness setting

Operation to be within office environment (25<sup>0</sup>C typical)



### 7.3 ON/OFF Cycle

The display module will be capable of being operated over the following ON/OFF Cycles.

ON/OFF	Value	Cycles
+Vin and CCFL power	30,000	10 seconds on / 10 seconds off

## 8.0 Safety

### 8.1 Sharp Edge Requirements

There will be no sharp edges or comers on the display assembly that could cause injury.

### 8.2 Materials

#### 8.2.1 Toxicity

There will be no carcinogenic materials used anywhere in the display module. If toxic materials are used, they will be reviewed and approved by the responsible AU Toxicologist.

#### 8.2.2 Flammability

All components including electrical components that do not meet the flammability grade UL94-V1 in the module will complete the flammability rating exception approval process. The printed circuit board will be made from material rated 94-V1 or better. The actual UL flammability rating will be printed on the printed circuit board.

### 8.3 Capacitors

If any polarized capacitors are used in the display assembly, provisions will be made to keep them from being inserted backwards.



## 9.0 Other requirements

### 9.1 National Test Lab Requirement

The display module will satisfy all requirements for compliance to

UL 1950, First Edition

U.S.A. Information Technology Equipment

CSA C22.2 No.950-M89

Canada, Information Technology Equipment

EEC 950

International, Information Technology Equipment




EN 60 950

International, Information Processing Equipment

(European Norm for IEC950)

### 9.2 Label

#### 9.2.1 Product label

		Model No: M170XW01 V.1 AU Optronics	02/09 MADE IN TAIWAN XXXXX	 E204356
MM1XXXXXXXXXX-XXXXX Sample :		RA Guarantee		
				
XXXXXXXXXXXXXXXXXXXXXXXX				

## 10.0 Mechanical Characteristics

